

REMARKS

Status of Claims

Claims 26-30 and 38 have been rejected under 35 U.S.C. §102(b). Claims 1-25, 32-37, and 39-46 are allowed. Claim 31 is objected to as being dependent upon a rejected base claim.

Claims 1-46 are currently pending. Claim 26 has been cancelled. Claims 27-31 and 38 have been amended. Basis for the amendment to claim 38 is found in FIGURES 4A and 4B and on page 9, lines 6-11, of the specification as filed. Claims 1-25 and 27-46 remain upon entering the present amendment. No new matter has been added.

Drawing Objections

The proposed newly added Figure 6, as filed on April 3, 2002, has been disapproved by the Examiner for allegedly containing new matter that was not described in the original disclosure. In particular, the Examiner stated in that Office Action that "the original disclosure does not describe the clearance (154) as shown in proposed Figure 6." Applicants withdraw their submission of Figure 6 as submitted on April 3, 2002.

In view of the Examiner's disapproval of the previously proposed Figure 6, Applicants submit another proposed new drawing labeled as Figure 6 to show the "arcuate-formed flank surface (which) is convex relative to said tooth." Applicants assert that the newly submitted proposed Figure 6 contains no matter that is not disclosed in the specification or claims as originally filed.

Specification Objections

The Examiner has objected to the amendment to the specification as filed on April 3, 2002, as introducing new matter into the disclosure.

In view of the newly proposed Figure 6, Applicants propose adding a new sentence to the Brief Description of the Drawings to describe Figure 6. Also, Applicants propose adding a paragraph describing the proposed Figure 6 as the penultimate paragraph of the Detailed Description. Because basis for the new Figure 6 is found in the originally filed specification and claims, Applicants assert that the new sentence in the

Brief Description of the Drawings and the paragraph in the Detailed Description is likewise supported by the originally filed specification and claims.

Claim Objections

Claim 31 has been objected to as being dependent upon a rejected base claim (claim 26). The Examiner states that claim 31 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In accordance with the Examiner's suggestion, Applicants have rewritten claim 31 in independent form to include all of the limitations of the base claim (claim 26). Claim 26 has been cancelled, and claims 27-30 have been amended to depend from claim 31.

Claim Rejections – 35 U.S.C. §102(b)

Claims 26-30 have been rejected under 35 U.S.C. §102(b) as being anticipated by Popov (U.S. Patent No. 4,047,449) (hereinafter "Popov"). Applicants have cancelled claim 26, thereby rendering the rejection of claim 26 moot.

Applicants have further amended the dependencies of claims 27-30 such that claims 27-30 ultimately depend from claim 31. Because claim 31 is now allowable (based on the Examiner's indication that claim 31 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims), and because claims that depend from an allowable claim add limitations to the independent claim, Applicants assert that claims 27-30 are allowable.

Claim 38 has been rejected under 35 U.S.C. §102(b) as being anticipated by Visser (U.S. Patent No. 3,122,938) (hereinafter "Visser"). For an invention to be anticipated under 35 USC §102, the reference must teach each and every aspect of the claimed invention either expressly or impliedly. Applicants respectfully submit that claim 38, as amended, is not anticipated by Visser under 35 U.S.C. §102(b) because aspects of Applicants' claim 38 are not taught by Visser either explicitly or implicitly.

Visser teaches a gear having a web 14 disposed on a hub 12, a rim 10 disposed on web 14, and rigid teeth 16 disposed on rim 10. "Web 14 is a flexible diaphragm of

relatively thin material which is adapted to be flexed to cause the gear teeth 16 to mesh with a helical gear.” (Column 2, lines 22-25). The teeth of the Visser invention are *rigid* (column 2, lines 15, 30, and 52-53) (emphasis added). Furthermore, “[w]hen it is stated...that the web...is flexible while the hub, rim and teeth are rigid,...what is meant is that [the deformation of] the hub, rim, and teeth ...is insignificant compared to the deformation of the web.” (Column 2, lines 29-33). Moreover, Visser teaches that “it is *essential* that the deformation of rim 10, teeth 16 and hub 12 be insignificant compared to the deformation of web 14.” (Column 2, lines 41-43) (emphasis added).

Visser further teaches a gear meshing in which “the teeth of gear 102 are wedged by an interference fit into the worm 100.” (Column 3, lines 61-63). The interference fit is effected by the spring loading of the elastic web. (Column 1, lines 40-41). Spring loading of the web causes it to “oilcan to keep the axis of shaft 110 normal to the axis of worm 100.” (Column 3, lines 69-70).

Visser fails to teach a worm/worm gear assembly in which the contact area between a tooth of the worm and a tooth of the worm gear is smaller at a low load condition and larger at a high load condition and such that the contact area at the low-load condition is located at a substantially different position from the contact area at the higher load condition, as is claimed in Applicants’ amended claim 38. Thus, imposing a load on the worm/worm gear assembly accordingly alters the size of the contact area. Altering the size of the contact area thereby alters the positioning of the contact area. In contrast, because the teeth of the gear of the Visser invention are *rigid* and all flexibility of the Visser gear originates from the hub, variation of the size of the contact areas at varying load conditions (during operation of the Visser invention) is precluded.

Therefore, Applicants assert that the worm/worm gear assembly of their claim 38 is patentably distinct from the invention of Visser. Consequently, because Visser does not teach what Applicants claim, viz., a worm/worm gear assembly in which the contact area between a tooth of the worm and a tooth of the worm gear is smaller at a low load condition and larger at a high load condition and such that the contact area at the low-load condition is located at a substantially different position from the contact area at the higher load condition, Applicants’ claim 38 is not anticipated by Visser. Applicants’

claim 38 is therefore believed to be allowable, and Applicants respectfully request that the rejection of claim 38 based on Visser be withdrawn.

Claim 38 has also been rejected under 35 U.S.C. §102(b) as being anticipated by Brown et al. (U.S. Patent No. 1,440,907) (hereinafter "Brown"). Applicants respectfully submit that claim 38, as amended, is not anticipated by Brown under 35 USC §102(b) because aspects of Applicants' claim 38 are not taught by Brown either explicitly or implicitly.

Brown teaches a "construction or formation of the thread of the worm or of a shape thereof." (Lines 12-14). The invention "consists in forming the thread of the worm with a surface such as would be generated by taking an oblique tangent to a cylinder and moving it along a helical line of contact at a constant angle taken to one hand on one surface of the thread and to the other hand on the opposite surface...." (Lines 20-27). "[W]hen a load is applied [to the worm gearing], the elasticity of the metal provides for a contact of greater area than is ordinarily obtainable and consequently gives an increased load carrying capacity between the two gears." (Lines 66-71).

Brown fails to teach a worm/worm gear assembly in which a worm gear is engaged in double flank contact with a worm such that a contact area between a tooth of the worm and a tooth of the worm gear is smaller in size at a low load condition than the contact area is at a higher load condition and such that the contact area at the low-load condition is located at a substantially different position from the contact area at the higher load condition, as is claimed in Applicants' amended claim 38. Applicants assert that their worm/worm gear assembly in which a tooth of the worm and a tooth of the worm gear is smaller in size at a low load condition than the contact area is at a higher load condition and such that the contact area at the low-load condition is located at a substantially different position from the contact area at the higher load condition is distinct from the Brown invention, in which the contact area between the teeth provides for a contact of greater area than is ordinarily obtainable (as a result of the elasticity of the metal) but remains substantially in the same position between the contacting teeth.

Therefore, Applicants assert that their worm/worm gear assembly is patentably distinct from the Brown invention. Because Brown does not teach what Applicants claim, viz., a worm/worm gear assembly in which the contact area between a tooth of the

worm and a tooth of the worm gear is smaller in size at a low load condition than the contact area is at a higher load condition and such that the contact area at the low-load condition is located at a substantially different position from the contact area at the higher load condition, Applicants' claim 38 is not anticipated by Brown. Applicants' claim 38 is therefore believed to be allowable, and Applicants respectfully request that the rejection of claim 38 based on Brown be withdrawn.

Conclusion

In view of the foregoing points that distinguish Applicants' invention from those of the prior art and render Applicants' invention not obvious, Applicants respectfully request that the Examiner reconsider the present application, remove the rejections, and allow the application to issue.

If the Examiner believes that a telephone conference with Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is invited to telephone the undersigned.

If additional charges are incurred with respect to this Amendment, they may be charged to Deposit Account Number 06-1130 maintained by Applicants' attorneys.

Respectfully submitted,

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Marked up version to show changes made:

27. (amended/marked up) The gear of claim ~~26~~31 wherein a first of said arcuately-formed flank surfaces on said tooth of said gear is configured and positionable to engage a first flank surface of a tooth on a mating gear, and wherein a first arcuately-formed facing flank surface on a successive tooth of said gear is configured and positionable to engage a second opposing flank surface of a tooth on said mating gear that is successive to said first tooth on said mating gear.

28. (amended/marked up) The gear of claim ~~26~~31 wherein said ~~at least one~~ arcuately-formed flank surfaces ~~is~~are concave relative to said tooth.

29. (amended/marked up) The gear of claim ~~26~~31 wherein said ~~at least one~~ arcuately-formed flank surfaces ~~is~~are convex relative to said tooth.

30. (amended/marked up) The gear of claim ~~26~~31 wherein each of said arcuately-formed flank surfaces is uninterrupted.

31. (amended/marked up) A single part gear capable of reducing backlash, comprising: a plurality of teeth disposed on an outer edge thereof, each tooth of said plurality of teeth having two arcuately-formed flank surfaces, said flank surfaces being arcuately-formed across a width of each tooth of said gear, said gear being efficiently operable under load conditions, and ~~The gear of claim 26 wherein said gear is being~~ configured to be run in double flank contact with a worm.

38. (amended/marked up) A worm/worm gear assembly, comprising:
 a worm; and
 a worm gear, said worm gear being engaged in double flank contact with said worm, ~~and wherein at a low load condition such that~~ a contact area between a tooth of said worm and a tooth of said worm gear is smaller in size at a low

load condition than said contact area is at a higher load condition, and such that said contact area at said low-load condition is located at a substantially different position from said contact area at said higher load condition.